

**Project**      **3.1 – Distributed Generation Assessment Project**  
**Task:**        **3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report**  
**Subject:**      **Deliverable 3.1.1.5**

**DRAFT DOCUMENT**

**San Francisco PUC/Hetch Hetchy  
Baseline Data Report for  
Project 3.1:  
DG Assessment Project**

Contractor: Energy & Environmental Economics, Inc.  
Contractor's Project Manager: Snuller Price

**Renewable Energy Research Program  
To Make Renewables Part of California's  
Affordable and Diverse Public Power System  
CONTRACT # 500-01-042**

***August, 2003***

Contract Manager: Fred Weiner – SFPUC  
Project Manager: Fred Schwartz - SFPUC  
Program Director: Ray Dracker - CRS  
CEC Project Manager: Val Tiangco

***Subject:      San Francisco PUC/Hetch Hetchy Baseline Data Report  
Deliverable 3.1.1.5***

## **Project 3.1 – Distributed Generation Assessment Project**

**Task:** 3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report

**Subject:** Deliverable 3.1.1.5

### **San Francisco Baseline Data Report**

In this document we describe the process we used and the information we gathered for engineering and economic analysis of renewable distributed generation (DG) in San Francisco. This deliverable is divided into 3 sections.

Section 1. Background on the San Francisco PUC/Hetch Hetchy System Summary

Section 2. Data Collection Process

Section 3. Summary of the Data

#### ***1. Background on SF PUC/Hetch Hetchy System Summary***

San Francisco Public Utilities Commission is a unique organization when compared to other regional municipal utilities. The SF PUC/Hetch Hetchy electricity utility operates within the same jurisdiction as the investor-owned utility Pacific Gas & Electric Company and does not currently own any distribution facilities within the City of San Francisco. Thus, the SF PUC purchases transmission and distribution services on the PG&E system. The SF PUC sells power generated from the Hetch Hetchy hydroelectric system to the Modesto and Turlock Irrigation Districts, its own municipal customers, and to other public and private agencies and commercial entities (San Francisco Port Authority, San Francisco International Airport). On the whole, SF PUC/Hetch Hetchy sells approximately 1.7 billion kWh per year. While the majority of this power is sold through existing contractual commitments, some excess power is available to sell through the local markets. A detailed explanation of the SF PUC/Hetch Hetchy system is contained in the San Francisco Energy Resource Plan.<sup>1</sup>

In addition to operating the Hetch Hetchy hydroelectric system, the SFPUC is committed to increasing the amount of renewable energy available to city residents and commercial and industrial users. In 2001, two propositions passed in San Francisco that allow for the financing of renewable power projects through the issuance of revenue bonds.<sup>2</sup> As such, this project will

---

<sup>1</sup> <http://www.sfgov.org/sfenvironment/aboutus/energy/resource-plan.pdf>

<sup>2</sup> Proposition B: Allows for the issuance of \$100 million in revenue bonds to finance renewable energy projects and Proposition H: Allows for issuance of general revenue bonds to finance renewable energy projects in the future.

## **Project 3.1 – Distributed Generation Assessment Project**

**Task:** 3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report

**Subject:** Deliverable 3.1.1.5

facilitate an understanding of the best location for installation of renewable energy generation within San Francisco's complex urban setting.

After several meetings between the SFPUC/Hetch Hetchy, E3, and other interested stakeholders to evaluate potential research areas, the team decided to focus on integrating renewable DG into the redevelopment planning of the Hunter's Point Naval Shipyard. The Hunter's Point Naval Shipyard location will begin a redevelopment project following on the heels of the environmental cleanup process ongoing in the area.

A map of the Hunter's Point Naval Shipyard is provided as Attachment 1.

### ***2. Data Collection Process***

This deliverable describes the data collection process and resulting data set acquired since the April 2, 2003 kick-off meeting and follows on from Deliverable 3.1.1.1, the San Francisco PUC/Hetch Hetchy Kick-off Meeting. During the kick-off meeting, the potential study area sites were discussed among the attendees and the data collection process was initiated shortly thereafter.

E3 and Electrotek Concepts provided the following data request memo to the SFPUC/Hetch Hetchy to begin the data collection process for the sites identified. Following the data request memo, the remainder of this baseline data report will demonstrate the data received, data pending, and the analysis activities for which this data will be used throughout the DG Assessment Project.

The renewable DG assessment analysis requires a broad set of information ranging from detailed circuit and engineering information, customer data, tariff and rate information, renewable resource availability, and cost and performance of renewable DG technologies.

## **Project 3.1 – Distributed Generation Assessment Project**

**Task:** 3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report

**Subject:** Deliverable 3.1.1.5

The process to collect the data was to conduct an initial kick-off meeting on April 2, 2003 (Deliverable 3.1.1.1) to introduce the project, the analysis we intend to pursue, and to describe the information we are looking to collect. This meeting was supplemented by a data request memo which describes the different categories of data, why we need particular data, and whether the data is essential or just desirable. The categories and components were to be used as a ‘checklist’ to organize information provided by SF PUC/Hetch Hetchy and to request clarifications which were done either by telephone, email, or additional meetings. To date, E3 has met with SFPUC/Hetch Hetchy staff over approximately five times to coordinate data collection on specific topics including:

- Local issues for siting DG
- SF PUC/Hetch Hetchy DSM/DG programs
- SF Department of the Environment efficiency programs
- Hunter’s Point Naval Shipyard redevelopment plan

The data collection memo is provided here.

### **Data Request Memo for Renewable DG Assessment**

This memo describes the data requirements for the renewable DG assessment analysis. The list below is intended as a guide to information that would be valuable in the DG assessment work. If the information requested is either not available or not readily available, please indicate this to us and we will try to identify alternative data sources. Conversely, if we have not asked for information that you feel should be considered, please include that information as well.

To help your team prioritize the data collection effort, we have categorized information as either required or desirable. Additionally, we indicate the information that is already available to E3 from other sources. If you have alternative sources of this information and would like to include it please do so.

We understand that some of the information we are requesting may be considered confidential. Our contract includes language to cover non-disclosure of the information you provide. We will not distribute any information outside of Energy and Environmental Economics, Inc., or Electrotek Concepts without your permission. If you have any question about confidentiality and non-disclosure, please contact us.

## **Project 3.1 – Distributed Generation Assessment Project**

**Task:** 3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report

**Subject:** Deliverable 3.1.1.5

### **Categories of Data in this Request**

1. Economic Information
2. Local Area Information
3. System Cost Information
4. Distributed Generation Technologies
5. Value of Clean Energy / Renewable Portfolio Goals

#### **1. Economic Information**

##### Basic Economic Assumptions (Required).

Evaluation of investments requires some basic economic information that you use for internal management. This includes your current cost of debt, as well as any internal rate of return benchmarks you may use to evaluate investments. Alternatively, if you do not have your current cost of debt, we can approximate this based on your current credit rating. If you have an internal assessment of inflation that you use to evaluate future investments, please provide it. Alternatively, we can use estimates of inflation rates for capital purchases and fuel.

##### Revenue Requirement Scalars (Required).

In addition, we need the scalar that you use to adjust direct capital costs to fully loaded costs. The full loading scalars are used to convert direct investment costs to fully-loaded revenue requirement levels. The loading accounts for tax effects, return on investment, operations and maintenance, and other cost items not explicitly included in budgetary cost estimates. For example, if the direct capital expenditure of an investment is \$1 million, what is the present value revenue requirement for that expenditure?

#### **2. Local Area Information**

We will require information specific to your service area to evaluate the local value of DG. Much of this information is desired, but not absolutely necessary. Most utilities will have the requested information for the whole service territory. If this information is available at a more disaggregated level it would be helpful to provide it to us at that level.

##### Load Growth Forecast (Required).

We need the load growth forecast for your service area to assess the local capacity value of DG. In addition to the system-wide forecast, please include forecasts for any local areas of the system with the potential for high-growth (e.g., areas with potential new developments, large block loads, or customers who can ramp up usage significantly).

##### Local Area Load Profile (Required).

In addition to the forecast peak load, information on the load pattern in the area is required. At a minimum we need to know the time of year that the area reaches its peak load, and the magnitude of the peak. However, hourly load profiles for a recent year for 1) the system and 2) at disaggregated levels, such as by substation feeder, would be useful.

## **Project 3.1 – Distributed Generation Assessment Project**

**Task:** 3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report

**Subject:** Deliverable 3.1.1.5

### *Distribution Expansion Plans (Required).*

To calculate avoided costs we need the costs and timing of planned capacity expansions of the distribution system. We only need to review investments that are driven by growth in the area and could potentially be deferred by DG (so reliability replacement type expenditures are not a priority). If there are not any capacity-related projects in the current capital plan, indicate if there are any areas that may have value for reduced peak loads in the foreseeable future.

### *Dispatch Pattern of Any In-Area Generation (Required).*

If you have any generation in the area, it would be useful to know the type of generation, its size, operating pattern, and other information that affects any on-going utility operations.

### *Number of Customers and Characteristics by Rate Type (Desired).*

Information about the size and demographics of the local customers can provide significant value in DG analysis. A typical way we divide customers is by rate class and feeder, since this is generally available and divides customers by residential / commercial / industrial. In addition, it is very useful to have information on the largest customers (how large, load factor, whether they currently have DG, reliability concerns) because these may be good candidate sites for DG projects. The customer demographic information is used in our analysis in the following ways:

- (1) Inferring information about the customer needs for reliability
- (2) Looking for potential behind-the-meter DG applications

### *Customer Outage Cost (Desired).*

We anticipate our analysis will include an estimate of the reliability benefits to customers. We have customer outage cost estimates based on a past surveys for residential, commercial, and industrial customers that we can use, however, if you have any utility specific information about customer outage costs (either hard numbers, or anecdotal information) that would be useful.

## **3. System Cost Information**

### *Transmission Avoided Cost (Required).*

A potential local value of DG is the displacement of the need for transmission services. Depending on the utility and situation, this value could be the deferral of a transmission capacity project, or transmission rate savings by reducing reservations of transmission requirements from PG&E. Please provide a summary of the transmission services your utility purchases. Along with this summary, please estimate an approximate avoided transmission cost savings if peak loads can be reduced with DG, if any.

### *System Energy Costs (Desired).*

We need to know the forecasted value of energy and capacity savings that can be attributed to DG. This is generally available as a long-run forecast from your purchasing department. Alternatively, we can use a state forecast of future energy prices in the near-term, and a long-run forecast based on the costs of a combined cycle natural gas plant and forward prices for natural gas.

## **Project 3.1 – Distributed Generation Assessment Project**

**Task:** 3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report

**Subject:** Deliverable 3.1.1.5

### **4. Distributed Generation Technologies (Desired)**

We will be evaluating several different types of distributed generation (DG), and as such we would like to have any specific cost and operating information that you may have available. We maintain a database of renewable DG technologies, including costs and operating characteristics, however, we are always looking for additional information. If you have available information on technologies that you specifically want included in the evaluation please let us know. Specific DG related data could include:

Typical cost components of a DG installation:

- Equipment purchase
- Financing
- Installation
- Engineering, permitting, interconnection
- Operating and maintenance
- Fuel purchases (heat rate, degradation over time if applicable)

Operating characteristics for DG, and DG performance:

- forced outage rate
- control method / dispatchability
- power quality of output
- protection scheme
- noise
- emissions

### **5. Other Information:**

- life of device
- local siting restrictions

### **6. Value of Clean Energy / Renewable Portfolio Goals (Desired)**

One of the challenges of the renewable DG assessment is to capture the ‘intangible’ or ‘soft’ benefits of DG. In order to give this evaluation some context, please provide any public language, stated renewable portfolio goals, or board meeting agenda items that relate to the purchase of renewable energy. Please provide the current percentage of energy that your utility purchases that your utility considers ‘renewable’ energy along with a definition of what type of energy generation is considered ‘renewable.’

Please include any other information on renewable energy programs such as:

- Past or current renewable energy demonstration projects
- Past or current green pricing programs and any indications of customer acceptance
- Other programs

**Project      3.1 – Distributed Generation Assessment Project**

**Task:        3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report**

**Subject:     Deliverable 3.1.1.5**

**3. *Summary of the Data Received to Date***

This section provides a summary of the data provided by SF PUC/Hetch Hetchy and other sources. At this point, we have collected all of the data we need to complete the assessment with the exception of the specific circuit and projected load data for the Hunter's Point Naval Shipyard area.

In order to complete the data collection process we have coordinated with the SF PUC/Hetch Hetchy staff and their consultants who are working to 1) establish the Hunter's Point Naval Shipyard redevelopment plan and 2) inventory and map out the electrical system and future requirements for the Hunter's Point Shipyard area. The initial data from these consultants will be available to our team in September 2003. In the meantime, we are continuing to acquire external information and data that will support our overall analysis and are on track to receive the critical inputs from the SF PUC/Hetch Hetchy consultants as they become available.

In Table 1, we provide the data checklist for information gathered or pending for the SF PUC/Hetch Hetchy analysis.



**Project 3.1 – Distributed Generation Assessment Project****Task: 3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report****Subject: Deliverable 3.1.1.5****Table 1: Data Collection Summary for SFPUC/Hetch Hetchy**

<b>Data Collected</b>	<b>Source</b>
<b>Economic Information</b>	
Inflation rate and Financial Assumptions	SF PUC/HH
<b>Local Area Information</b>	
Distribution Capacity Upgrades in SF Area	SF PUC/HH
Hunters Point Shipyard Electrical Upgrade Plans	SFPUC/HH consultant
Solar Monitoring Project Data	SFPUC/HH
Background on Hunters Point Shipyard Area	U.S. Navy
Maps of Study Areas: Hunters Point Shipyard/Treasure Island	U.S. Navy
Anticipated Load Requirements Based on the Hunters Point Shipyard Redevelop plans	SFPUC/HH consultant
<b>System Cost Information</b>	
Hunters Point Shipyard Electrical Upgrade Plans	SFPUC/HH consultant
Value of Energy	SF PUC/HH
<b>Distributed Generation Technology Information</b>	
Renewable technology costs	E3 Database
<b>Value of Clean Energy / Renewable Portfolio Goals</b>	
SF PUC/Hetch Hetchy List of Solar Energy Values	SFPUC/HH
Renewable DG Value Map	E3 Prepared

**Project**      **3.1 – Distributed Generation Assessment Project**  
**Task:**        **3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report**  
**Subject:**     **Deliverable 3.1.1.5**

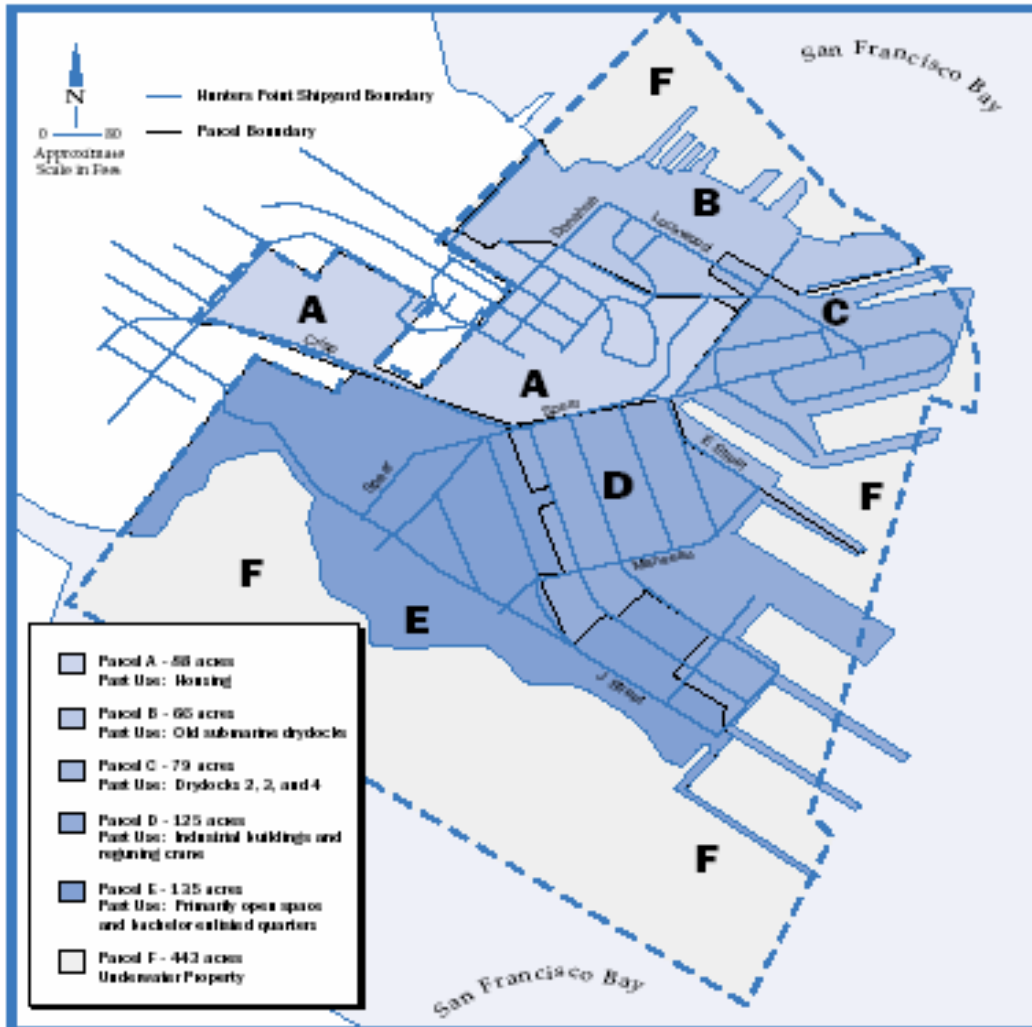
**Attachment 1:**  
**Hunter’s Point Naval Shipyard Area Map**

**Project 3.1 – Distributed Generation Assessment Project**

**Task: 3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report**

**Subject: Deliverable 3.1.1.5**

**Hunters Point Shipyard Parcel Boundaries**



**Project**      **3.1 – Distributed Generation Assessment Project**  
**Task:**        **3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report**  
**Subject:**     **Deliverable 3.1.1.5**

**Attachment 2:**  
**San Francisco Solar Monitoring Program Summary**

## Project 3.1 – Distributed Generation Assessment Project

Task: 3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report

Subject: Deliverable 3.1.1.5

# San Francisco Solar Monitoring Network

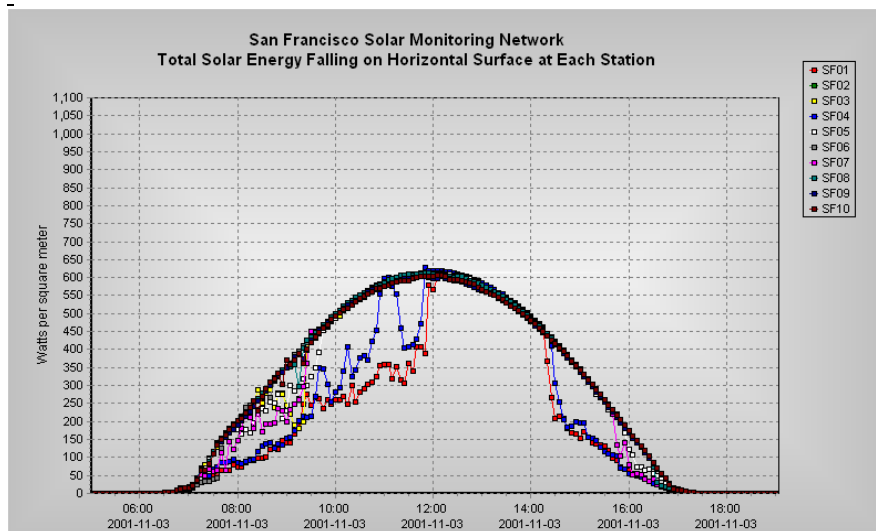
## Description and Documentation for posted plots and downloadable data files

San Francisco's Solar Energy Monitoring Network consists of 11 monitoring stations located on roofs of various city-owned buildings as shown on the [network map](#). The network was designed, installed, and operated by [Augustyn + Company](#) of Berkeley California under contract to the San Francisco Public Utilities Commission Hetch Hetchy Department of Water and Power.

Each solar monitoring station measures the total solar energy falling on a horizontal surface, along with air temperature and wind speed. Sensor readings are taken every second, and averages are stored every five minutes throughout the day. These averages are collected from each station, processed, inspected, plotted and posted to the network web site each day.

The available plots and data files are as follows:

## Daily Plots



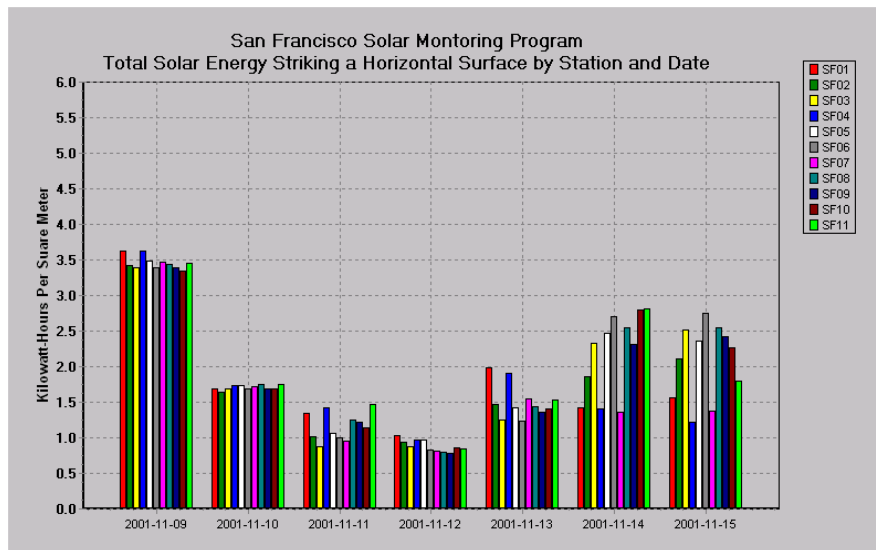
Each 5 minute average of total solar energy falling on a horizontal surface at each site is plotted as a uniquely colored line on this single plot. By superimposing solar plots from all stations from the same day on a single plot, variations from one site to another can be seen.

## Project 3.1 – Distributed Generation Assessment Project

Task: 3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report

Subject: Deliverable 3.1.1.5

### Weekly Plots



Each bar shown in this plot is the total energy striking a horizontal surface over the entire day at the indicated station. All such totals for each day are grouped for easy comparison.

**Project**      **3.1 – Distributed Generation Assessment Project**  
**Task:**        **3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report**  
**Subject:**     **Deliverable 3.1.1.5**

### **Attachment 3: Renewable DG Value Map**

## **Project 3.1 – Distributed Generation Assessment Project**

**Task:** 3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report

**Subject:** Deliverable 3.1.1.5

The renewable DG Value Map is a visual map of the major intangible value streams that we intend to use to account for total value of renewable DG. Our team created this map from the sources and references listed below and it is meant to be used to help planners incorporate intangible value streams in their decision making process without mixing intangible with tangible values. This map will be developed further throughout our renewable DG assessment process.

Sources and references for renewable DG value map:

1. San Francisco Public Utility Commission / Hetch Hetchy Internal List for Solar Energy
2. Sustainable Energy for Economic Development  
A joint project of Minnesotans for an Energy-Efficient Economy, Minnesota Project, Clean Water Fund, and Sustainable Resources Center  
<http://www.me3.org/projects/seed/benefits.html>
3. The Renewable Energy Policy Project/Center for Renewable Energy and Sustainable Technologies
  - a. <http://solstice.crest.org/>
  - b. Various presentations and commentary on this website provided proposed and actual values for renewable energy technologies
4. Lovins, Amory, B. et al. *Small is Profitable: The Hidden Economic Benefit of Making Electrical Resources the Right Size*. Rocky Mountain Institute. 2002.
5. National Renewable Energy Laboratory  
[www.nrel.gov](http://www.nrel.gov)
6. World Resources Institute: Green Power Market Development Group  
<http://www.thegreenpowergroup.org/>
7. Regulatory Assistance Project  
[www.raponline.org](http://www.raponline.org)
8. Electric Power Research Institute  
[www.epri.com](http://www.epri.com)
9. U.S. Department of Energy: Energy Efficiency and Renewable Energy  
[www.eren.doe.gov](http://www.eren.doe.gov)
10. U.S. EPA Clean Energy Programs  
<http://www.epa.gov/cleanenergy/>
11. Sacramento Municipal Utility District Solar Program  
<http://www.smud.org/pv/index.html>



**Project 3.1 – Distributed Generation Assessment Project**

**Task:** 3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report

**Subject:** Deliverable 3.1.1.5

12. American Wind Energy Association  
[www.awea.com](http://www.awea.com)
13. BP Solar  
[www.bpsolar.com](http://www.bpsolar.com)
14. Powerlight  
[www.powerlight.com](http://www.powerlight.com)
15. Natural Resources Defense Council  
[www.nrdc.org/nrdcpro/rbr/rbinx.html](http://www.nrdc.org/nrdcpro/rbr/rbinx.html)
16. GE Wind Energy  
[http://www.gepower.com/dhtml/wind/en\\_us/index.jsp](http://www.gepower.com/dhtml/wind/en_us/index.jsp)
17. California Energy Commission Renewables Program  
<http://www.energy.ca.gov/renewables/index.html>
18. California Energy Commission Renewables Program  
<http://www.energy.ca.gov/pier/>
19. Center for Resource Solutions  
[www.resource-solutions.org](http://www.resource-solutions.org)
20. Oakridge National Laboratory  
[www.ornl.gov](http://www.ornl.gov)
21. Sierra Club  
<http://www.sierraclub.org/energy/>
22. Natural Resource Defense Council  
[www.nrdc.org](http://www.nrdc.org)

**Task:** 3.1.1.5 – San Francisco PUC/Hetch Hetchy Baseline Data Report  
**Subject:** Deliverable 3.1.1.5

## Renewable DG Value Map

